United States Patent

Kemper

[15] **3,662,888**

[45] **May 16, 1972**

[54] RECIRCULATING TOILET SYSTEM AND FILTER THEREFOR

[72] Inventor: **James Morgan Kemper,** Hollywood, Calif.

[73] Assignee: **Monogram Industries, Inc.,** Los Angeles, Calif.

[22] Filed: **Apr. 29, 1971**

[21] Appl. No.: **138,727**

[52] **U.S. Cl.** **210/167,** 4/10

[51] **Int. Cl.** **C02c 1/26**

[58] **Field of Search** 210/167, 60, 70, 141, 198, 210/248, 299, 312, 355, 416, 472, 532; 4/115, 120, 10

[56] **References Cited**

UNITED STATES PATENTS

3,505,690	4/1970	Lockwood	4/115
3,275,550	9/1966	Daubenspeck	210/60
2,172,031	9/1939	Norman	210/472
1,303,358	5/1919	Montgomery	210/60
3,001,205	9/1961	Hicks	4/90
3,593,345	7/1971	Wells	4/78
1,081,130	12/1913	Miller	4/115

Primary Examiner—Reuben Friedman
Assistant Examiner—T. A. Granger
Attorney—Golove, Kleinberg & Morganstern, Leonard Golove, Marvin H. Kleinberg and Richard Morganstern

[57] **ABSTRACT**

A portable toilet system of the recirculating type is provided with a perforated metal filter of a size and open area relative to the container or tank to provide for a minimal flow rate of liquid from the tank to the filter interior. This prevents movement of waste products and paper which would tend to block or close the openings of the filter when the system is activated; nevertheless, the filter is simply constructed and economical to manufacture and assemble.

4 Claims, 2 Drawing Figures

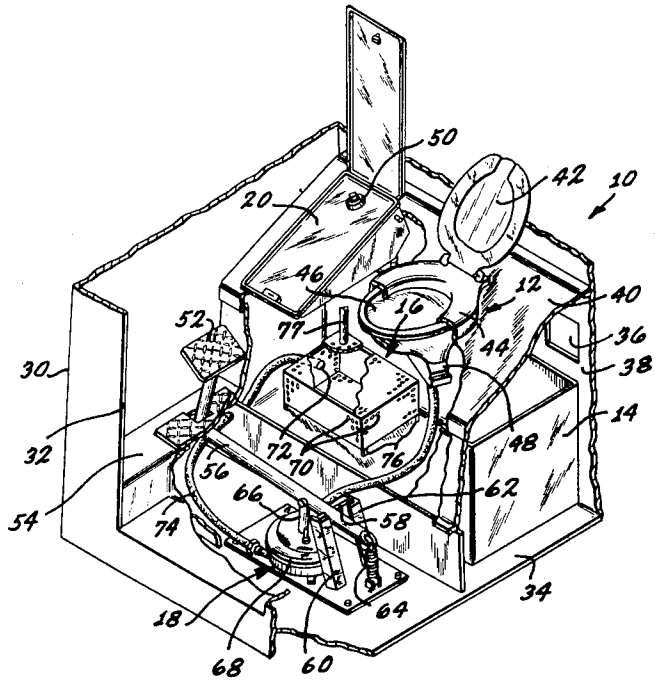


FIG. 1

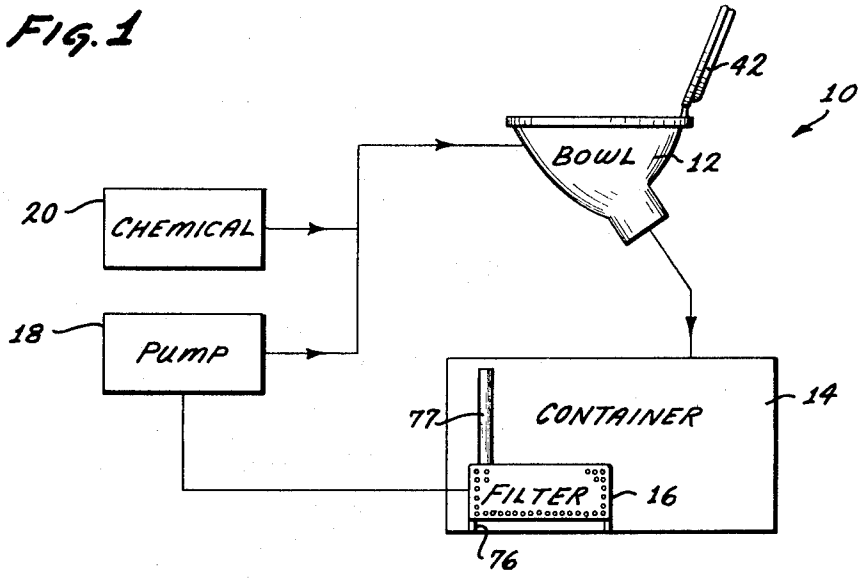
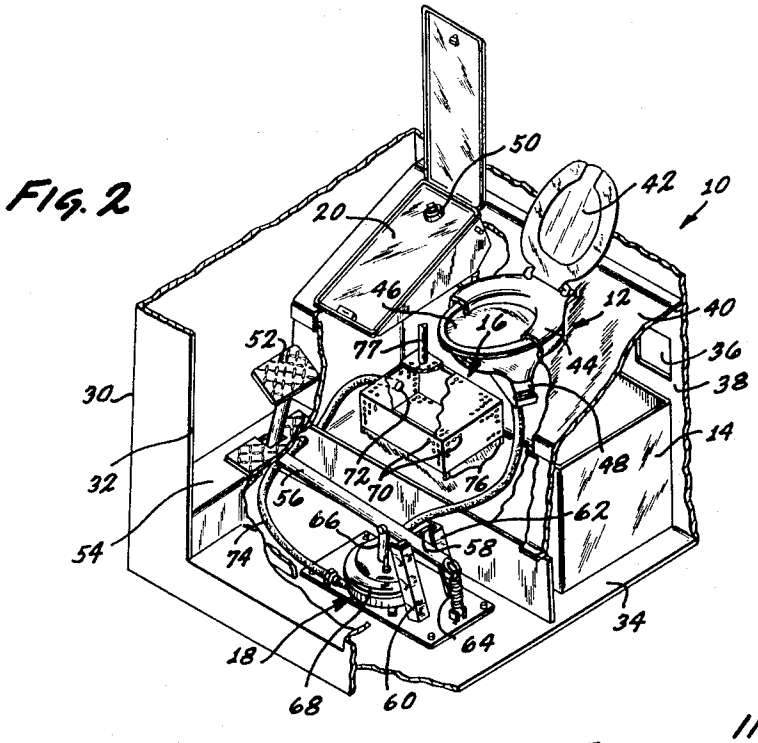


FIG. 2



INVENTOR
JAMES M. KEMPER

RECIRCULATING TOILET SYSTEM AND FILTER THEREFOR

BACKGROUND OF THE INVENTION

1. Field of the Invention

The present invention relates to a recirculating toilet system and, more particularly, to a recirculating toilet system with a filter which ensures a sufficiently low flow rate of fluid as to eliminate clogging of the filter by waste products.

2. Description of the Prior Art

Portable toilets have long been used at such places as construction sites, cap sites and at those locations where large outdoor public gatherings are infrequent so that permanent facilities are uneconomical or impractical. In addition, portable toilet systems are now available for vehicles such as buses, trains, planes, boats, and campers. Early toilet systems were nothing more than structures suitably located so that waste products dropped directly into a cesspool. Later and more sophisticated recirculating systems use enclosed tanks to receive the waste products, the tanks being initially charged with a mixture of water and chemicals.

In this latter system, the water-chemical charge is recirculated by a pump during the flushing process. A major problem of such a system has been the clogging of a filter with waste products or paper after a plurality of usages of the toilet system. For example, U.S. Pat. No. 3,473,171 to Palmer illustrates a recirculating, vehicle toilet system having a generally cylindrical-shaped filter with a series of circumferential slits surrounding the pump intake. The slits allow the passage of the water-chemical charge from a main tank to be drawn into the interior of the filter and then pumped to a bowl to cause the desired flushing.

To ensure that the filter slits do not become blocked, a rotating basket is provided with a stationary scraper blade which cleans the outer surface of the filter each time the toilet system is activated. As a compact system, the apparatus disclosed in the Palmer patent works exceedingly well. However, such a system is still relatively complex and expensive. The simpler mechanisms and improved filters have been disclosed in the patent to Kemper, U.S. Pat. No. 3,567,032 issued Mar. 2, 1971, and in the copending application of Kemper Ser. No. 65,095, filed Aug. 19, 1970, now U.S. Pat. No. 3,634,891 and assigned to the assignee of the present invention.

It is to be understood that any system or mechanism developed for a toilet system which is a mass-produced item must be simply constructed, easy to service, easy to clean and easy to replace so as to allow mass marketing at a reasonable cost.

SUMMARY OF THE INVENTION

The present invention solves the above-mentioned problems and fulfills economic requirements by providing a portable recirculating toilet system comprising an outer cabinet; a container connected to and positioned within the cabinet for receiving liquid and waste products; a bowl assembly for flushing liquid through the bowl assembly; a perforated metal filter positioned within the container, the filter providing for a very low flow rate; and means for communicating the flushing means with the filter, and the flushing means with the bowl assembly.

More specifically, the invention includes perforated metal filter comprising a housing having perforated walls and an interior space, the housing located within the liquid container; and an opening in one of the walls for communicating the interior space with a pump intake wherein the housing is of a size and open area to create a minimal flow of liquid from the container into the interior space when the pump is activated, whereby waste products within the container are substantially undisturbed by the flow replenishing the contents of the filter interior, thereby preventing blockage of the filter wall.

It is a general aim of the present invention to provide a recirculating toilet system and a filter for such a system which will not become clogged during normal usage of the system.

Another aspect of the present invention is the provision of a recirculating toilet system with a filter creating a very low flow rate through the filter.

Still another object of the present invention is to provide a recirculating toilet system which is simply constructed, inexpensive to manufacture, easy to assemble and suitable for facilitated service techniques.

Yet another aspect of the present invention is to provide a filter for a recirculating toilet system having a sufficient capacity to provide liquid to a pump to allow multiple flushings while ensuring optimum sanitation.

Other objects and advantages of the invention will appear from the following description taken in conjunction with the accompanying drawings.

BRIEF DESCRIPTION OF THE DRAWINGS

FIG. 1 is a diagrammatic view of a recirculating toilet system.

FIG. 2 is a partially cut away perspective view of a recirculating toilet system illustrating, in particular, the improved filter system of the present invention.

DESCRIPTION OF THE PREFERRED EMBODIMENT

While the present invention is susceptible of various modifications and alternative constructions, an illustrative embodiment is shown in the drawing and will herein be described in detail. It should be understood, however, that it is not the intention to limit the invention to the particular form disclosed; but, on the contrary, the intention is to cover all modifications, equivalents and alternative constructions falling within the spirit and scope of the invention as expressed in the appended claims.

Referring now to FIG. 1, there is illustrated in diagrammatic form a recirculating toilet system **10** comprising a bowl assembly **12**, a container **14**, a filter **16**, an actuator pump **18** and a chemical reservoir **20**. In general, the bowl receives human waste products which are flushed into the container **14**. The container is initially charged with a water-chemical mixture to ensure sanitation and provides enough capacity to handle a predetermined number of uses of the system. The filter **16** is provided to allow the liquid within the container to be recirculated while the pump **18** removes the liquid from the filter interior to cause the flushing of the waste products from the bowl assembly. A suitable chemical from the reservoir is provided, preferably during each operation of the pump, to ensure proper sanitation.

It is an important aspect of the present invention to provide a simply constructed, inexpensively manufactured and assembled recirculating toilet system which is easy to service, that is, easy to clean and recharge. Referring now to FIG. 2, a preferred embodiment of a portable recirculating toilet system **10** is illustrated which includes an outer cabinet **30** made of a suitable material and of sufficient size to allow a user to enter through a doorway **32** and comfortably use the system.

The container **14** is positioned on a floor **34** of the cabinet with access to the container for cleaning and recharging being gained through a removable panel **36** in a wall **38** of the cabinet. A panel **40** is connected to the interior of the cabinet and serves to cover the container **14** as well as to offer a support for the bowl assembly **12** and the chemical reservoir **20**.

The bowl assembly **12** includes a cover **42**, a seat **44** and a bowl **46**. A chute **48** is provided at the bottom of the bowl to direct waste products into the container **14**. The chemical reservoir **20** is mounted generally flush with the panel **40** and includes a plugged opening **50** to allow the addition of chemical to the reservoir.

The pump **18** is of the diaphragm type and is operated by a foot pedal **52** which projects from a floor **54** of the cabinet. The foot pedal in turn is attached to a lever arm **56** which is pivoted on a shaft **58**. In turn, the shaft is supported by two angle irons **60** and **62**. The foot pedal **52** is connected to one end of the lever arm **56** while a spring **64** is connected at the

other end of the lever arm. Between the pivot shaft **58** and the foot pedal is a depending leg **66** which enters the pump **18** to move the diaphragm within the pump housing **68**. The spring **64** assures that the pedal **52** is returned to its raised position to allow further operation of the pump.

It is an important aspect of the present invention to provide a filter which reduces or eliminates clogging by ensuring a very low flow rate of liquid from the container **14** to the interior of the filter **16**. At the same time, the filter is of sufficient size so that the pump **18** can be activated a multiple number of times. Thus, the highest level of sanitation is maintained without necessitating an overly complex and expensive mechanism.

Referring to FIG. **2** once again, in a first embodiment the filter **16** is comprised of a rectangular polyhedron having six perforated sides with one of the sides **70** having an opening **72** to receive a conduit **74**. The filter **16** is supported on four small legs such as leg **76**. Filter **16** is made of metal which in a preferred embodiment is perforated with 0.045 holes. The total open area of the holes in the perforated metal is 619 square inches. The volume of liquid inside the filter **16** is, in a preferred embodiment, 8¾ gallons. This amount of liquid is capable of flushing the toilet approximately eight times.

The interior of the filter is vented either to atmosphere or to the air space within the container. When the toilet is being flushed, the presence of the vent **77** limits the differential pressure across the filter so that solids are not projected by great forces into the filter openings. Accordingly, a relatively slow flow rate, insufficient to carry or disturb solid or semi-solid waste products or paper which may be disposed in the container, refills the filter interior.

Thus, there is no "strong" current flow urging the waste product material against the perforations of the filter thereby causing the filter to be blocked. Further, there is no need for any external device similar to the scraper blades described hereinabove in relation to the Palmer patent; a very simply constructed, inexpensive device is provided for effectively filtering the liquid in the container **14** to allow a properly functioning sanitary recirculating system.

The filter area can be established by the size of the individual openings and the space between adjacent openings. The size of the filter must be large enough so that no more than 25 percent of the filter's volume is evacuated in any one flushing operation, and in the preferred embodiment, approximately 12 percent is evacuated in each operation. The fluid flow into the filter would then stay below flow rates that would impart substantial motion to the suspended solids and other waste products in the reservoir.

In one particular preferred embodiment, the perforated metal filter measures 18 by 28 by 4 inches and has a total of 1,376 square inches of surface. Each of the sides of the filter had been punched with a plurality of holes, each having a diameter of 0.046 inches, so that the filter has an open area of 619 square inches or roughly 45 percent open area. The pump nominally has a capacity of 1 gallon per stroke which is generally adequate for a single flushing. The capacity of the filter is 2,016 cubic inches or about 8¾ gallons. Thus, after actuation of the pump, the velocity of the water flow is thus about 0.06 inches per second. As already mentioned, this flow is barely observable and of insufficient force to cause a movement of waste products or paper to the filter to cause blockage or clogging. The perforated metal filter is constructed of stainless steel having a thickness of 0.025 inches. The filter is placed into a container having a usable capacity of about 71 gallons, and there is a 14.5 gallon percharge of water and chemical. It has been calculated that the container would allow over a thousand usages of the toilet system before the container must be emptied.

It is clear that larger and smaller volume filters might be employed, depending upon the volume of fluid removed with each flushing operation. It is important that the replenishment of the filtered fluid be at a rate sufficiently slow so as to impart a negligible velocity to suspended solids and waste products. In such an environment, it is not necessary to "clean" the filter during use.

I claim:

1. A recirculating toilet system comprising:
an outer cabinet;
a container connected to and positioned within said cabinet for receiving liquids and waste products;
a bowl assembly connected to and positioned within said cabinet;
flushing means connected to said bowl assembly for applying flushing liquid through said bowl assembly;
a perforated metal filter positioned within said container, said filter providing for a very low flow rate; and
means for communicating said flushing means and said filter, and said flushing means and said bowl assembly;
said perforated metal filter comprising a housing having perforated walls and an interior space, said housing being of a size and open area to create a minimal flow of liquid from said container into said interior space when said flushing means are activated;
said interior space, flushing means capacity, and container size being related to provide a flow rate of liquid into said interior space when said flushing means are activated of approximately 38.5 cubic inches per second;
said perforated walls being approximately 45 percent open;
the perforations of said walls being approximately 0.046 inches in diameter; and
said housing having six walls and including legs to support the filter above the bottom of said container.

2. A recirculating toilet system comprising:
an outer cabinet
a container connected to and positioned within said cabinet for receiving liquids and waste products;
a bowl assembly connected to and positioned within said cabinet;
flushing means connected to said bowl assembly for applying flushing liquid through said bowl assembly;
a perforated metal filter positioned within said container, said filter providing for a very low flow rate;
means for communicating said flushing means and said filter, and said flushing means and said bowl assembly,
said perforated metal filter comprising a separate enclosure having perforated walls and an interior space;
support means for supporting said enclosure filter above the bottom of said container;
the interior space within said filter enclosure being at least twice as large as the volume of said bowl and the interior volume of the container being sufficiently greater than that of the filter enclosure to retain the major portion of the solid waste products out of contact with the filter enclosure during each flushing operation.

3. In the system of claim **2**, vent means coupling the interior of said filter with air at ambient pressure to limit the pressure differential across said filter.

4. In the system of claim **2**, said filter walls being about 45 percent open;
the perforations through said walls being about 0.046 inches in diameter; and
said filter being in the form of a six sided rectangularly shaped basket.

* * * * *